(No Model.) 3 Sheets—Sheet 1.

# C. H. MORGAN.

## WIRE CORRUGATING MACHINE.

No. 333,323. Patented Dec. 29, 1885.

Fig. 1.

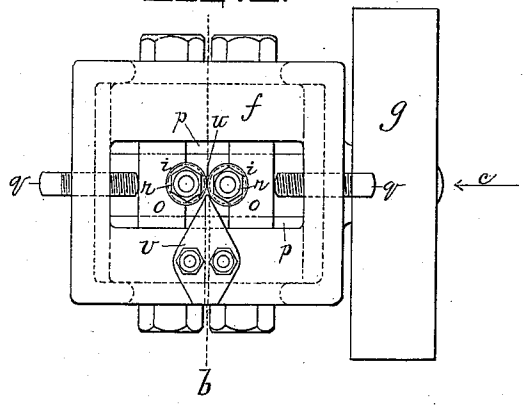
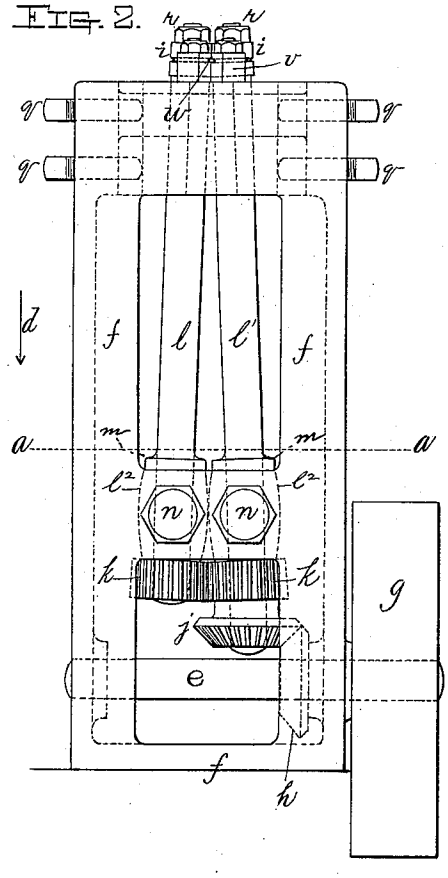



Fig. 2.




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By A. A. Barker.
Att'y.

N. PETERS. Photo-Lithographer, Washington, D. C.

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# C. H. MORGAN.

## WIRE CORRUGATING MACHINE.

No. 333,323. Patented Dec. 29, 1885.

Fig. 3.

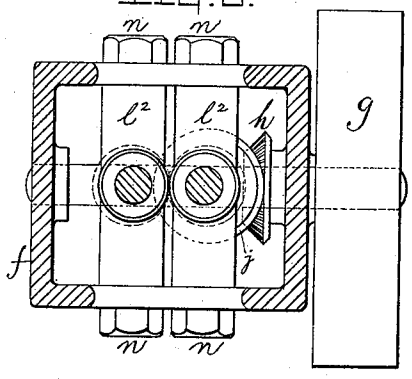



Fig. 4.

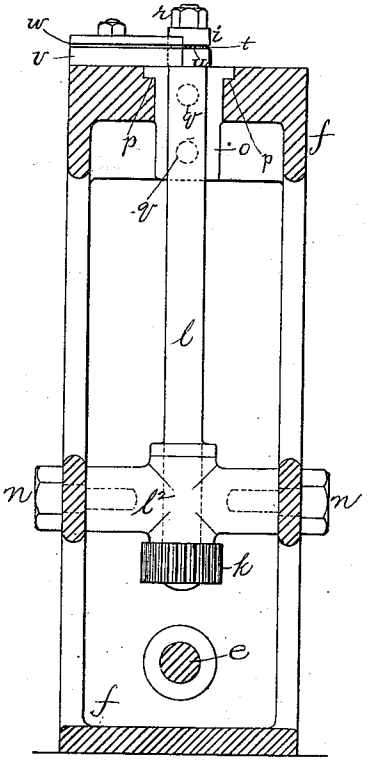



Fig. 6.

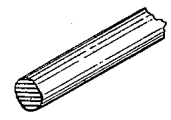


Fig. 7.

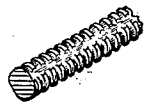
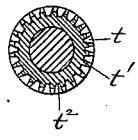


Fig. 5.




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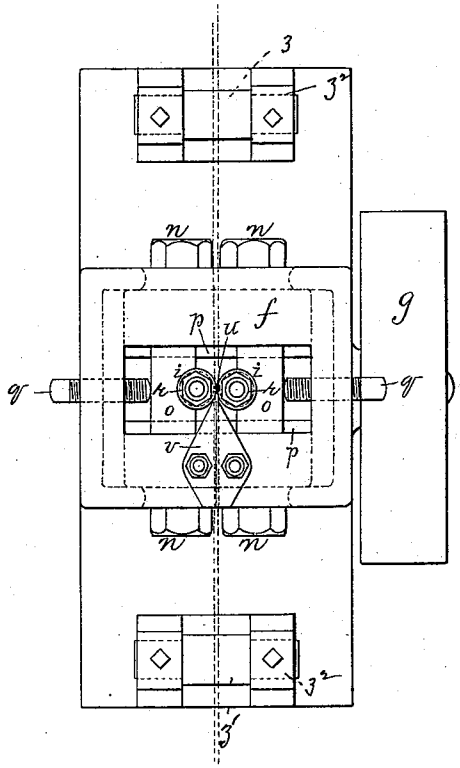
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# C. H. MORGAN.

## WIRE CORRUGATING MACHINE.

No. 333,323. Patented Dec. 29, 1885.

Fig. 8.




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N. PETERS, Photo-Lithographer, Washington, D. C.

# UNITED STATES PATENT OFFICE.

CHARLES H. MORGAN, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE WASHBURN & MOEN MANUFACTURING COMPANY, OF SAME PLACE.

## WIRE-CORRUGATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 333,323, dated December 29, 1885.

Application filed May 28, 1885. Serial No. 166,921. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES H. MORGAN, of Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Wire-Corrugating Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 represents a top or plan view of my aforesaid wire-corrugating machine. Fig. 2 represents a front side view of the machine shown in Fig. 1. Fig. 3 represents a transverse section through the machine, taken on line *a a*, Fig. 2, looking in the direction of arrow *d*, same figure. Fig. 4 represents a central vertical section through the machine, taken on line *b*, Fig. 1, looking in the direction of arrow *c*, same figure. Fig. 5 represents a horizontal section through one of the corrugating-rolls of my machine, which will be hereinafter more fully described. Fig. 6 represents a piece of plain flattened wire, such as is ordinarily used in making corrugated wire, for the purpose hereinafter stated; Fig. 7, a similar piece of wire after having been corrugated by passing the same through my machine, as hereinafter described, the last three figures all being shown upon an enlarged scale; and Fig. 8 represents a plan view of my improved machine in combination with a pair of rolls in advance of the machine for flattening the wire, as shown in Fig. 6, prior to entering said machine, and with another pair of rolls for removing or flattening the burrs formed on the wire by the corrugating operation, at each side of the corrugations, as will be hereinafter more fully explained.

My invention relates to machines for forming lateral or cross corrugations or ribs on the surface of wire, such as is ordinarily used in wire-pegging machines in the manufacture of boots and shoes. Its object is to produce a machine whereby said corrugated wire may be made in a more satisfactory and expeditious manner, and at less cost than has heretofore been possible by the use of other machines for a similar purpose.

My said invention consists in the combination of a pair of grooved and milled rolls arranged at an angle to each other, with means for supporting and operating said rolls and for guiding the corrugated wire therefrom.

It also consists in the combination of my aforesaid corrugating-machine with a pair of rolls for flattening the wire prior to entering said machine, and a pair of rolls for removing the burrs formed thereon at each side of the corrugations by the corrugating operation, as will be hereinafter more fully set forth.

To enable those skilled in the art to which my invention appertains to make and use the same, I will proceed to describe it more in detail.

In the drawings, the part marked *e* represents the main driving-shaft of the machine, which is fitted to turn in suitable bearings in the frame *f*. Said shaft *e* is provided with a large driving-pulley, *g*, and with a bevel-gear, *h*, which bear upon opposite sides of a part of the frame *f*, and thus hold the shaft *e* in its proper position longitudinally. Power is imparted from the aforesaid bevel-gear *h* to turn the grooved rolls *i i* through the bevel-gear *j*, spur-gears *k k*, and shafts *l l'*, upon the upper ends of which said grooved rolls are arranged. The shafts *l l'* are fitted at their lower ends in the horizontal parts $l^2 l^2$, being held in position longitudinally by means of the shoulders *m m* and spur-gears *k k*, aforesaid. The parts $l^2 l^2$ are in turn pivoted at each end on pivot-screws or bolts *n n*, fastened in the frame *f*, thus by this arrangement hinging the lower ends of the shafts *l l'*, so that they may be swung in or out at their upper ends to adjust the grooved rolls *i i* toward or from each other. Said shafts *l l'* are adjusted at the top, as aforesaid, by means of the sliding parts *o o*, which are fitted to the surfaces of the shafts, and to slide forward and back on ways *p p*, formed in the frame *f*, and by means of the adjusting-screws *q q*, fitted to turn in or out of said frame-work, as is fully shown in the drawings. The shaft *l'* is extended down a little longer than the shaft *l*, as shown in Fig. 2, so that the bevel-gear *j* may be fastened thereto below the spur-gear *k* on said shaft. The grooved rolls *i i* are fitted to turn on the upper ends of the hinged shafts *l l'* against shoulders formed thereon, being

held in position by means of the nuts *r r*. They are made considerably smaller in diameter than their driving-gears *k k*, for the purpose hereinafter stated, said result being accomplished by arranging the shafts *l l'* thereof at an inclined angle to each other from said gears to the rolls, to correspond to the difference in size of said parts, as is shown in Fig. 2 of the drawings. The faces of the gears and rolls, in order to work properly, are also beveled to correspond therewith. The purpose of the aforesaid arrangement is to admit of the rolls *i* being made as small as practicable, so that the least possible surface of said rolls will come in contact with the surface of the wire in forming the corrugations in the latter, as hereinafter described.

I find in practice that by the use of small rolls much better results are effected than by the use of rolls as large as would be necessitated by the use of parallel shafts, the corrugations being more perfectly formed and less injury caused to the wire than by the use of larger rolls. It will be obviously seen that if such shafts were arranged parallel to each other, and the proper size of driving-gears used to operate said shafts in that position, much larger rolls would be necessitated, therefore necessitating a larger proportion of rolling-surface to be brought in contact with the wire being operated upon, which, as will also be seen, tends to crush considerably as well as cut said wire, and thus form imperfect corrugations thereon, whereas by the use of small rolls having short and sharp curves, as in my machine, only a small portion of the surface of the wire is operated upon at one time, thereby causing sharp cuts or indentations to be made in said wire, which entirely obviates the aforesaid objection and enables the production of perfectly-corrugated wire. The rolls *i i* are not only provided with circular grooves *t*, but said grooves are also grooved or milled crosswise of the same to form teeth or ribs *t'*, as shown in Fig. 5 of the drawings. It is therefore evident that when the plain wire (shown in Fig. 6) is passed through the opening *u*, between the rolls, said wire will be cut or indented by the aforesaid cross ribs or teeth *t'*, thus forming corrugations on its surface, as shown in Fig. 7. The wire is held in its proper position and guided while being corrugated and fed forward by means of a suitable guide, *v*, fastened to the top of frame *f*. Said guide may be made in two parts, as shown, or in one part, as preferred.

It is obvious that with so slight an inclination in the shafts *l l'*, as shown in the drawings, only a slight taper to the faces of the grooved rolls and spur-gears is required, and even that may be dispensed with, and the same made with parallel faces with very good results, although I prefer the former method in practice. The lower ends of said shafts may also (instead of being hinged as hereinbefore described) be arranged in suitable bearings or boxes admitting of the slight movement required to adjust their upper ends, as also hereinbefore described.

It will be understood that wire used for the purpose hereinbefore named, and for the manufacture of which my machine is principally intended, is flattened prior to being corrugated, as shown in Fig. 6. The opening *w* in the guide *v* is therefore made oval in shape to correspond therewith, thus effectually preventing the wire from turning, and insuring perfect work in the corrugating operation. As will be readily seen, the depth of the corrugations may be varied to a considerable extent by adjusting the rolls so as to increase or decrease the size of the opening *u*, as hereinbefore described, thus also admitting of considerable variation in the size of the wire corrugated by the machine. Ordinarily the rolls would be run in contact with each other, and wire used whose diameter is equal to the depth of the cross-grooves $t^2$, formed in said rolls. (See Fig. 5.)

In treating wire by the use of my machine, as hereinbefore described, it is fed to the same from suitable reels, and also coiled up after completion upon similar reels, both arranged at a short distance from said machine and operated in the usual way. The wire, which is flattened on two sides, as shown in Fig. 6 of the drawings, is exposed edgewise to the corrugating-rolls *i i*. Therefore when the ribs *t'* on said rolls come in contact with the edges of said flattened wire, they not only crush the surface to form the indentations hereinbefore described, but at the same time force out a portion of the metal at each end of said indentations by said crushing operation, thus forming sharp burrs or "fins" projecting beyond the face of the flattened sides of said wire. It is therefore necessary to remove the same by a subsequent operation, which is performed by passing said corrugated wire flatwise between a pair of plain rolls, *z*. Said operation, as well as that of flattening the wire preparatory to entering my machine, may be performed by separate operations, or the three operations carried on continuously in conjunction with said machine, as illustrated in Fig. 8 of the drawings, the wire being flattened by passing between a pair of plain rolls, *z'*, and guided to and from said plain rolls by means of suitable guides, and also unwound from and coiled upon suitable reels, as hereinbefore described. The several parts illustrated in Fig. 8 being shown in plan view, only the top rolls, *z z'*, of said pairs of rolls are in view; but as they, as well as their housings $z^2$, are of ordinary well-known construction and arrangement, further illustration or description of the same is unnecessary.

Although I have shown and described the rolls *i* as having only one set of milled grooves *t*, (the number I prefer in practice,) two or more sets may be used, so as to corrugate more than one wire at a time, if desired, and said wire may be treated in either a cold or heated state, as preferred.

Previous to my invention, instead of form-

ing independent cross ribs or corrugations upon flattened wire by compression, as hereinbefore described, a continuous thread has been cut in the surface of the wire to accomplish a similar result, in like manner to cutting a screw-thread upon a shaft or other threaded part. The latter process, as will be obviously seen, is a very slow and therefore expensive manner of accomplishing the desired result, while at the same time it greatly weakens and otherwise impairs the wire thus corrugated, one half of the outer shell of said wire (which, as is well understood, is by far the stronger and best part of the wire) being cut away, thereby greatly weakening the same, and also rendering it more liable to injury by exposure by thus cutting away a portion of its outer finished coating than if such corrugations were made by compression, as hereinbefore described.

By the use of my machine the wire may be corrugated not only in a perfect, but very expeditious manner, the wire being in practice fed tween the rolls at a high rate of speed not attainable by the old methods, and thereby enabling me to manufacture said corrugated wire at a large reduction in cost over said old methods.

I am aware that a machine for screw-threading wire is not new in which the wire to be threaded is rotated and the threads cut by a stationary cutter or threading-tool acting upon the wire during its passage from one spool to another, such a machine being already patented to Louis Goddu, January 13, 1885, and numbered 310,817. I therefore make no claim to a screw-threading machine in a broad sense; but limit my invention to the machine and its application hereinbefore described and shown in the drawings for making lateral indentations or cross-corrugations in the wire, instead of spiral threads cut in said wire, as in the patented machine above referred to.

Having described my improved machine for corrugating wire, what I claim therein as new and of my invention, and desire to secure by Letters Patent, is—

1. In a machine for making lateral indentations or corrugations in wire, the combination of a pair of grooved and milled rolls, a pair of hinged roll-supporting shafts, their fulcrums, the frame of the machine, means for rotating the aforesaid hinged shafts and grooved and milled rolls, and means for forcing the outer ends of the shafts and their respective rolls toward each other and for holding the same after adjustment, substantially as shown and described.

2. The combination of a machine for corrugating wire, consisting of a pair of grooved and milled rolls mounted on the outer ends of shafts whose axes are arranged at an angle to each other, and means for adjusting and operating said shafts and for supporting and holding the several parts of said machine, with a pair of plain rolls for flattening the wire preparatory to its entering the corrugating-machine aforesaid, all arranged to operate upon the wire continuously, substantially as shown and described.

3. The combination of a machine for corrugating wire, consisting of a pair of grooved and milled rolls mounted on the outer ends of shafts whose axes are arranged at an angle to each other, means for adjusting and operating said shafts and for supporting and holding the several parts of said machine, with a pair of plain rolls for flattening the wire preparatory to its entering the corrugating-machine aforesaid, and a pair of plain rolls for removing the burrs formed on said wire by the corrugating operation, all arranged to operate upon the wire continuously, substantially as shown and described.

CHAS. H. MORGAN.

Witnesses:
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ALBERT A. BARKER.